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PALEONTOLOGY.—*Seven new genera of Carboniferous Crinoidea Inadunata.*¹ EDWIN KIRK, U. S. Geological Survey.

A considerable number of inadunate crinoids with turbinate dorsal cups, three anal plates in the cup, and with varying arm structures have been described from the Carboniferous. In earlier years these species were, as a rule, described as *Poteriocrinus* or *Scaphiocrinus*. Latterly many of them have been referred to *Pachylocrinus* or *Scytalocrinus*. The assignment has been based primarily on whether the arms divide above the first dichotomy. A study extending over a number of years of practically all the described species and a considerable series of undescribed species has shown that such a casual grouping obscures both the biologic and stratigraphic relationships of the crinoids. In some cases, owing to the poor quality of the types and uncertainty of accurate placement of well-preserved material, description of the genera will have to wait upon description of adequate specific material.

In forming these inadunate genera and others to be established, consideration has been given to all known species and large numbers of undescribed species. It may seem at times that some of the genera are too closely circumscribed. However, one must either use the inclusive genera of the past with stratigraphic ranges in some cases from the Silurian to the Carboniferous, or attempt to delimit phyletic groups that have real stratigraphic and genetic significance. Hundreds of complete crowns are available for study in the museums. These give pertinent information as to ontogenetic development and permissible variation in structures. In the case of most genera they also furnish adequate phylogenetic series.

Blothrocrinus, n. gen.

Genotype.—*Poteriocrinus jesupi* Whitfield.

Generic diagnosis.—

Crown. Very high, widening gradually distad, then gradually contracting.

Dorsal cup. Turbinate; plates smooth.

IBB. High, forming an appreciable amount of the cup wall.

BB. Large.

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- RR. Large; articulating facet full width of R, slightly curved, suture not gaping.
- IBr. Two in all rays except anterior (irregularly one IBr in early species); in ant R, IBr range in number from 3 (one specimen) to 14 as seen, the average being about 10.
- Arms. The arms are very long, rounded, and with slightly cuneate brachials. In earlier species and in some of the later ones the arms are endotomous, with two or three divisions above the primaxil. In some species the first admedian ramus divides, giving approximately isotomous arms but leading toward para-endotomy.
- Post IR. Three anal plates in cup; RA large, penetrating between the post B and r post B to about one-half their height; X large, meeting post B on wide, horizontal face, about one-half the plate rising above the level of the RR. RT large, extending well above level of RR.
- Ventral sac. The ventral sac is imperfectly known. A portion of ventral sac with fragments of arms was identified by Springer (1900) as *Blothrocrinus swallowi*. According to this, the ventral sac was long and slender and made up of fragile plates, plentifully pierced with pores along their margins. Another specimen, a partial set of arms, shows a portion of the sac similar to that figured by Springer. The sac extended nearly to the tips of the arms.
- Column. Circular in section with pentagonal lumen.
- Characteristic species of the genus.*—

***Blothrocrinus cultidactylus* (Hall), n. comb.**

- Poteroicrinus cultidactylus* Hall, p. 62, 1860. "Base of the Burlington limestone, near Hamburgh, Illinois."—Worthen, p. 301, pl. 30, fig. 1, 1883.
- Poteroicrinus (Scaphiocrinus) cultidactylus* Wachsmuth and Springer, p. 114 (337), 1880.
- Scaphiocrinus cultidactylus* Wachsmuth and Springer, p. 237 (161), 1886.

***Blothrocrinus jesupi* (Whitfield), n. comb.**

- Poteroicrinus jesupi* Whitfield, p. 7, pls. 1, 2, 1881. "Burlington limestone, Burlington, Iowa." (Upper Burlington.)
- Pachylocrinus jesupi* Springer, p. 71, 1926.
- Scaphiocrinus swallowi* (Meek and Worthen) (pars). (Cited as synonym of.) Wachsmuth and Springer, p. 235 (159), 1886.

***Blothrocrinus spartarius* (Miller and Gurley), n. comb.**

- Poteroicrinus spartarius* Miller and Gurley, p. 37, pl. 7, fig. 1, 1890a. "Kinderhook, Le Grand, Iowa." (Hampton formation.)
- Pachylocrinus spartarius* Springer, p. 71, 1926.—Laudon and Beane, p. 254, pl. 19, fig. 5; pl. 18, fig. 2, 1937.
- Poteroicrinus scopae* Miller and Gurley, p. 38, pl. 7, fig. 2, 1890a.
- Poteroicrinus genista* Miller and Gurley, p. 38, pl. 7, fig. 3, 1890a.

***Blothrocrinus swallowi* (Meek and Worthen), n. comb.**

- Poteroicrinus swallowi* Meek and Worthen, p. 397, 1860.—Meek and Worthen, p. 183, pl. 16, figs. 4a, b, 1866. "Burlington limestone, Burlington, Iowa." (Upper Burlington.)
- Poteroicrinus (Scaphiocrinus) swallowi* Wachsmuth and Springer, p. 114 (337), 1880.

Geologic and geographic distribution.—*Blothrocrinus* as known ranges from the Kinderhook to the Burlington-Keokuk "transition beds" of the Mississippi Valley.

Relationships.—In its arm pattern *Blothrocrinus* resembles *Pachylocrinus*, the only described genus with which it can be compared. The presence of numerous IBr in the anterior ray and the long, slender rami of *Blothrocrinus* as against the consistent two IBr and short rami of *Pachylocrinus* are the more obvious differences in arm structure. The turbinate dorsal cup of *Blothrocrinus* is in marked contrast to the depressed bowl-shaped cup of *Pachylocrinus*. The ventral sac of *Blothrocrinus* is long and slender, while that of *Pachylocrinus* is relatively short and stout.

Remarks.—It has been the custom to identify all large *Blothrocrinus* from the upper Burlington as *swallowi* Meek and Worthen. *Blothrocrinus jesupi*, here chosen as genotype, may or may not be synonymous with *swallowi*. The original description and the poor figure of the badly preserved type of *swallowi* make it impossible to identify the species with certainty. It has seemed wise to choose the splendid specimens used as types of *jesupi*.

Cydrocrinus, n. gen.

Genotype.—*Poteriocrinus coxanus* Worthen.

Generic diagnosis.—

Crown. Of medium height, compact, expanding gradually to about three-fourths its height, then contracting.

Dorsal cup. Broadly turbinate, cup plates relatively thin, unornamented.

IBB. Large, making up an appreciable amount of the cup.

BB. Large.

RR. Articulating facet full width of the R, slightly crescentic. Suture not gaping.

IBr. Two in all rays (variation possible in ant R, as apparently in the type specimen of *C. concinnus*, the only case known).

Arms. Para-endotomous, that is, each half-ray is endotomous. Two to three divisions in each half of the half-ray, giving a great number of closely crowded rami. Br wedge-shaped to cuneate. Pinnules long, moderately stout.

Post IR. RA large, pentagonal, not entering deeply between the post and r post BB. X large, extending well above the level of the R. RT smaller.

Ventral sac. Unusually broad and stout, composed of large plates with radiating ridges, nodose, but not spinous. The sac has a height of about three-fourths or three-fifths the height of the crown.

Column. Circular in section, lumen pentalobate.

Characteristic species of the genus.—

Cydrocrinus concinnus (Meek and Worthen), n. comb.

Poteriocrinites (*Zeacrinus*?) *concinnus* Meek and Worthen, p. 26, 1870.—Meek and Worthen, p. 490, pl. 14, fig. 3, 1873. (Called *Zeacrinus concinnus* in explanation of plate.) "Keokuk, Crawfordsville, Indiana." (Upper Borden.)

Poteriocrinus (*Pachylocrinus*) *concinnus* Wachsmuth and Springer, p. 116 (339), 1880.

Cydrocrinus coxanus (Worthen), n. comb.

Poteriocrinus coxanus Worthen, p. 4, 1882. "Upper part of Keokuk limestone, Hamilton, Illinois."—Worthen, p. 269, pl. 27, fig. 1, 1883.

Scaphiocrinus coxanus Wachsmuth and Springer, p. 237 (161), 1886.

Pachylocrinus coxanus Springer, p. 71, 1926.

Cydrocrinus subramulosus (Worthen), n. comb.

Poteriocrinus subramulosus Worthen, p. 14, 1882.—Worthen, p. 284, pl. 27, fig. 6, 1883. "Keokuk limestone, Keokuk, Iowa."

Poteriocrinus (*Scaphiocrinus*) *swallowi* Meek and Worthen (pars). (Cited as synonym of.) Wachsmuth and Springer, p. 237 (161), 1886.

Geologic and geographic distribution.—The genus as known ranges from the upper Burlington of Iowa (undescribed species) to the upper Borden of Indiana and Keokuk of Iowa.

Relationships.—Superficially *Cydrocrinus* most nearly resembles *Blothrocrinus*. The relatively short, compact crown of *Cydrocrinus*, with its numerous rami, as against the very long, slender crown of *Blothrocrinus* is a most obvious difference. In *Cydrocrinus* all rays normally have two IBr against the numerous IBr in the ant R of *Blothrocrinus*. The relatively short, very stout ventral sac of *Cydrocrinus*, composed of large heavy plates, is in marked contrast to the long, slender, fragile sac of *Blothrocrinus*. The turbinate cup and para-endotomous arms of *Cydrocrinus* are in marked contrast to the depressed cup and endotomous arms of *Pachylocrinus*.

Ascetocrinus, n. gen.

Genotype.—*Scaphiocrinus rusticellus* White.

Generic diagnosis.—

Crown. Tall, slender, compact, expanding slowly to about three-fourths its height, then contracting.

Dorsal cup. Subturbinate, with flattened base. Pits at angles of plates. Very fine linear ornamentation.

IBB. Small, practically concealed by column, but showing in side view.

BB. Medium size.

RR. Large; articulating facet extending full width of R, linear to slightly crescentic; suture slightly gaping.

IBr. One in all rays, high, deeply constricted medially.

Arms. Long, slender, endotomous. Two or three divisions above the primaxil. In one specimen in one ray the first admedian ramus divides. Br high, with marked lateral shoulders for support of pinnules, giving the ramus a *Decadocrinus*-like zigzag appearance. Pinnules long, slender.

Post IR. RA large, pentagonal, seated well down between post and r post BB. X large, extending upward well above the radial facet. RT large, lying mostly above the level of the radial facet.

Ventral sac. Slender, composed of about eight vertical series of plates on the posterior side, with pores at angles. Sac about one-half the height of the arms, recurved.

Column. Stellate in section in proximal position; pentagonal, with concave faces, changing to circular in section going distad. Nodals prominent.

Lumen pentagonal.

Characteristic species of the genus.—

Ascetocrinus rusticellus (White), n. comb.

Scaphiocrinus rusticellus White, p. 505, 1863. "Lower division of the Burlington limestone, Burlington, Iowa."—Keyes, p. 212, pl. 26, fig. 1, 1894.

Poteriocrinus (*Scaphiocrinus*) *rusticellus* Wachsmuth and Springer, p. 113 (338), 1880.

Abrotocrinus rusticellus Springer, p. 72, pl. 16, fig. 11, 1926.

Ascetocrinus whitei (Hall), n. comb.

Scaphiocrinus whitei Hall, p. 306, 1861.—Hall, p. 7, 1861a. "Burlington limestone, Burlington, Iowa." (Lower Burlington.)

Poteriocrinus whitei Wachsmuth and Springer, p. 112 (337), 1880. "Lower Burlington limestone."

Geologic and geographic distribution.—Known at present only in the lower and upper Burlington limestones of Iowa.

Relationships.—Springer (1926, p. 72) referred *Ascetocrinus rusticellus* to *Abrotocrinus* Miller and Gurley. *Abrotocrinus* he defined as a *Pachylocrinus* with a pentagonal column, this character being "not a very reliable one." As a matter of fact, *Abrotocrinus* is a well-characterized genus. *Ascetocrinus* differs from *Abrotocrinus* in many respects. The compact, narrow crown of *Ascetocrinus* is in marked contrast to the irregular, expanded crown of *Abrotocrinus*. In *Abrotocrinus* there are many IBr in the ant R as against the single IBr in *Ascetocrinus*. The dorsal cup of *Ascetocrinus* is much less depressed than that of *Abrotocrinus*. The ventral sac in *Abrotocrinus* is stout, expanded in its apical portion, and usually spinous. The sac of *Ascetocrinus* is very slender, short, and delicate.

Hypselocrinus, n. gen.

Genotype.—*Poteriocrinus hoveyi* Worthen.

Generic diagnosis.—

Crown. Very high, slender.

Dorsal cup. High, narrowly turbinate.

IBB. High, making up an appreciable part of the dorsal cup.

BB. Large; r post B supporting RA on its upper sloping shoulder; post B supporting X and RA.

RR. Large; articulating facet full width of the R, linear.

IBr. One in all rays, except anterior. Ant ray one IBr or atomous. IBr long, constricted medially in earlier forms, slightly constricted, broad and shorter in later species (two IBr exceptionally found in one or two rays).

Arms. Very long, slender, typically not dividing above main dichotom (irregular divisions of rami rarely noted in upper Borden). Ant ray typically atomous, in some species dichotomous. Br cuneate. An adult specimen of *Hypselocrinus hoveyi* with a cup 1.7 cm in height has arms 25 cm long. Pinnules long, slender.

Post IR. Three anals in cup; RA high on upper shoulders of post and r post BB; X large, extending well above level of r post R. RT approximately one-half within the cup.

Ventral sac. Long, slender, composed of 10 or more vertical series of hexagonal plates, wider than high. Sac six to seven times the height of the cup. A ventral sac 9.8 cm in length has a width of but 1.2 cm.

Column. Circular in section.

Characteristic species of the genus.—

Hypselocrinus arcanus (Miller and Gurley), n. comb.

Poteriocrinus arcanus Miller and Gurley, p. 29, pl. 5, fig. 4, 1890. "Keokuk Group, Washington County, Indiana."

Hypselocrinus boonvillensis (S. A. Miller), n. comb.

Poteriocrinus boonvillensis S. A. Miller, p. 42, pl. 8, figs. 3, 4, 1891. "Keokuk Group, Booneville, Missouri."

Hypselocrinus calyculus (Hall), n. comb.

Poteriocrinus calyculus Hall, p. 553, pl. 9, figs. 6a-c, 1858. "Burlington limestone, Burlington, Iowa."—Hall, pl. 2, fig. 11, 1860.

Scaphiocrinus calyculus Hall, pl. 6, fig. 1, 1872.—Wachsmuth and Springer, p. 120 (345), 1880.

Hypselocrinus douglassi (Miller and Gurley), n. comb.

Poteriocrinus douglassi Miller and Gurley, p. 83, pl. 5, figs. 16, 17, 1896a. (Madison limestone.)

Decadocrinus douglassi Laudon, p. 68, pl. 7, fig. 7, 1933.

Hypselocrinus hoveyi (Worthen), n. comb.

Poteriocrinus hoveyi Worthen (in Worthen and Meek), p. 516, pl. 29, fig. 6, 1875. "Keokuk, Crawfordsville, Indiana." (Upper Borden.)

Scytalocrinus hoveyi Springer, p. 145, pl. 16, fig. 8, 1900.

Poteriocrinus (Scytalocrinus) robustus (Hall) (pars).—Wachsmuth and Springer, p. 118 (343), 1880.

Hypselocrinus maccabei (Miller and Gurley), n. comb.

Poteriocrinus maccabei Miller and Gurley, p. 34, pl. 3, figs. 3-6, 1894. "Kinderhook Group, Le Grand, Iowa." (Hampton formation.)

Scytalocrinus maccabei Laudon and Beane, p. 258, pl. 17, fig. 13; pl. 18, figs. 6, 7; pl. 19, fig. 6, 1937.

Poteriocrinus maccabei var. *decrepitus* Miller and Gurley, p. 36, pl. 3, figs. 9-12, 1894.

Poteriocrinus hammondi Miller and Gurley, p. 35, pl. 3, figs. 7, 8, 1894.

Hypselocrinus macrodactylus (Meek and Worthen), n. comb.

Poteriocrinites (Scaphiocrinus) macrodactylus Meek and Worthen, p. 140, 1869. "Lower Burlington, Burlington, Iowa."—Meek and Worthen, p. 415, pl. 2, fig. 9, 1873.

Poteriocrinus (Scytalocrinus) macrodactylus Wachsmuth and Springer, p. 117 (342), 1880.

Hypselocrinus neglectus (Miller and Gurley), n. comb.

Poteriocrinus neglectus Miller and Gurley, p. 31, pl. 4, figs. 3-5, 1896. "Keokuk Group, Booneville, Missouri." (Warsaw.)

Hypselocrinus pleias (Hall), n. comb.

Poteriocrinus pleias Hall, p. 8, 1863.—Hall, p. 57, 1864.—Hall and Whitfield, p. 173, pl. 12, fig. 8, 1875. "Waverly group, Richfield, Summit county, Ohio."

Poteriocrinus (*Decadocrinus*) *pleias* Wachsmuth and Springer, p. 119 (342), 1880.

Hypselocrinus tethys (Meek and Worthen), n. comb.

Poteriocrinites (*Scaphiocrinus*) *tethys* Meek and Worthen, p. 143, 1869. "Upper Burlington, Burlington, Iowa."—Meek and Worthen, p. 419, pl. 2, fig. 13, 1873.—Wachsmuth and Springer, p. 114 (339), 1880.

Geologic and geographic distribution.—As known, the genus ranges from the upper Burlington to the upper Borden.

Relationships.—*Hypselocrinus* among described genera most nearly resembles *Scytalocrinus*. *Scytalocrinus* has relatively short, stout arms as against the long, relatively slender rami of *Hypselocrinus*. In *Scytalocrinus* the IBB lie in a depression in the species with bowl-shaped dorsal cups and are barely visible in side view in the campanulate species. In *Hypselocrinus* the IBB are prominent and high. They form an appreciable part of the cup. The ventral sac of *Hypselocrinus* is very long and slender. In *Scytalocrinus* the sac is short and relatively stout.

Remarks.—It does not seem desirable to separate those species with two rami in the anterior radius from the typical form with a single ramus. Atomous and dichotomous anterior radii are both found in such compact genera as *Scytalocrinus* and *Decadocrinus*, while in *Graphiocrinus* arm reduction is carried outside the anterior radius, and one specimen has but seven rami. In *Phanocrinus* of the Chester one or more species show but five rami in a usual 10-rami genus, and in other species an occasional ray, usually the anterior, is atomous. In this case there could be no valid excuse for separating the forms generically.

Sladen (1878, p. 245) proposed the new genus *Dactylocrinus pro D. loreus* n. sp. = *Poteriocrinus tenuis* Austin non Miller. The generic name had been preoccupied by Quenstedt (1876). The genotype is obviously a very young individual and its affinities uncertain. Such characters as are shown in the poor illustrations are essentially those of *Hypselocrinus*. The adult crinoid may have been quite different, however.

Poteriocrinus fusiformis Hall is referable to this genus. The name was preoccupied by Roemer, but no new name should be proposed. The species was based on a dorsal cup and IBr only and may well be identical with *Hypselocrinus macrodactylus* (Meek and Worthen).

Histocrinus, n. gen.

Genotype.—*Poteriocrinus* (*Scytalocrinus*) *grandis* Wachsmuth and Springer
Generic diagnosis.—

Crown. Compact, high.

Dorsal cup. Subturbinate, plates thin, smooth, or with faint radial plications.

IBB. Well exposed in side view.

BB. Medium size.

RR. Articulating facet slightly crescentic, extending nearly the full width of the R. Suture not gaping.

IBr. Two in all rays except anterior. Ant ray two IBr or atomous.

Arms. Moderately stout, composed of cuneate brachials. Arms dichotomous except in anterior ray, which may be dichotomous or atomous (typical.) The Burlington species alone of the known species is dichotomous in the anterior ray. The pinnules are moderately stout and stand out stiffly from the ramus.

Post IR. RA is large, resting subequally on post and r post BB. X is of about the same size as RA and extends well above the level of the RR.

RT is smaller and lies almost entirely above the level of the RR.

Ventral sac. The ventral sac is subcylindrical, expanding slightly distad. The tube is reflexed, carrying the tip of the sac and the anal opening well down on the anterior side. On its posterior side the sac shows five vertical series of plates. This is one of the genera in which Springer (1900, p. 144) demonstrated the presence of pores in the ventral sac. The plates at the distal recurved portion of the sac are tumid to subspinous.

Column. The column is circular in section and made up of prominent series of nodals and internodals.

Characteristic species of the genus.—

Histocrinus grandis (Wachsmuth and Springer), n. comb.

Poteriocrinus (*Scytalocrinus*) *grandis* nom. nov. pro *Poteriocrinus coreyi* Worthen 1875, non *Poteriocrinites* (*Scaphiocrinus*) *coreyi* Meek and Worthen 1869.—Wachsmuth and Springer, p. 118, 1880.

Decadocrinus grandis Wachsmuth and Springer, pl. 7, figs. 4, 5, 1897. (The figures are, however, *Decadocrinus tumidulus* (Miller and Gurley).)

Poteriocrinus coreyi Worthen (in Worthen and Meek), p. 516, pl. 29, figs. 2, 3a, b, 1875.

Histocrinus graphicus (Miller and Gurley), n. comb.

Scaphiocrinus graphicus Miller and Gurley, p. 50, pl. 10, fig. 4, 1890. "Keokuk Group, Crawfordsville, Indiana." (Upper Borden.)

Histocrinus juvenis (Meek and Worthen), n. comb.

Poteriocrinites (*Scaphiocrinus*) *juvenis* Meek and Worthen, p. 146, 1869. "Lower Burlington, Burlington, Iowa."—Meek and Worthen, p. 417, pl. 2, fig. 8, 1873.

Poteriocrinus (*Decadocrinus*) *juvenis* Wachsmuth and Springer, p. 119 (342) 1880.

Geologic and geographic distribution.—The genus as known is found in the Burlington and Keokuk of the Mississippi Valley and the Borden of Indiana.

Relationships.—*Histocrinus* combines characters diagnostic of the unrelated genera *Decadocrinus* and *Hypselocrinus*. The erect, stout arms with their heavy comblike pinnules are similar to those of *Decadocrinus*. The subturbinate cup, the relatively thin, smooth cup plates, and the large prominent IBB could fall under *Hypselocrinus*. The ventral sac is structurally like *Decadocrinus* but is relatively shorter. The presence of two IBr,

the character of the arms, and the more turbinate cup distinguish *Histocrinus* at once from *Scytalocrinus*.

One must consider the possibility of intergeneric crosses among the crinoids. This is by no means the only instance of combined generic characters suggesting such a cross.

Phacelocrinus, n. gen.

Genotype.—*Poteriocrinus wetherbyi* S. A. Miller.

Generic diagnosis.—

Crown. High, subcylindrical or spreading distad.

Dorsal cup. Subturbinate to campanulate.

IBB. High, making up an appreciable part of the dorsal cup.

BB. Medium size; r post B supporting RA; post B supporting X and RA.

RR. Large; articulating facet full width of R, slightly crescentic, suture gaping.

IBr. Two or fusing irregularly to one compound brachial, though suture can often be seen. In both cases the compound brachial is very high and deeply constricted medially.

Arms. Two undivided rami to the ray is typical. In some of the Chester specimens irregular branching occurs. Br cuneate, with long, slender pinnules. The maximum length of arms seems to be about six or seven times the height of the cup.

Post IR. Three anal plates in cup. RA penetrates well down between post and r post BB. X extends above level of RR, sometimes separated from post B in the Chester forms. RT mostly out of the cup.

Ventral sac. Cylindrical, with a maximum height of about four times that of the cup. Composed of vertical series of hexagonal plates of nearly the same height and breadth.

Column. Pentagonal in section.

Characteristic species of the genus.—

Phacelocrinus bisselli (Worthen), n. comb.

Poteriocrinites bisselli Worthen (in Meek and Worthen), p. 546, pl. 21, fig. 4, 1873. "Chester, Chester, Illinois."

Poteriocrinus (Scytalocrinus) bisselli Wachsmuth and Springer, p. 117 (340), 1880.

Phacelocrinus columbiensis (Worthen), n. comb.

Poteriocrinus columbiensis Worthen, p. 22, 1882. "Chester limestone, near Columbia, Monroe county, Ill." (Renault.)—Worthen, p. 293, pl. 29, fig. 6, 1883.

Decadocrinus columbiensis Wachsmuth and Springer, p. 239 (163), 1886.

Phacelocrinus dactyliformis (Hall), n. comb.

Scaphiocrinus dactyliformis Hall, p. 670, pl. 17, fig. 6, text fig. 105, 1858. "St. Louis limestone: St. Louis, Missouri."

Poteriocrinus (Scaphiocrinus) dactyliformis Wachsmuth and Springer, p. 112 (335), 1880.

Phacelocrinus decabrachiatus (Hall), n. comb.

Scaphiocrinus decabrachiatus Hall, p. 679, pl. 25, fig. 1, text fig. 106, 1858.
 "Kaskaskia limestone: Kaskaskia, Illinois." (St. Louis limestone *vide* Worthen, 1883.)

Poteroicrinus (Scytalocrinus) decabrachiatus Wachsmuth and Springer, p. 117 (340), 1880.

Phacelocrinus gracilis (Troost), n. comb.

Agassizocrinites gracilis Troost, p. 420, 1849. (Nom. nud.)—Troost, p. 62, 1850. (Nom. nud.)—Troost, p. 88, pl. 11, fig. 9, 1909.

Scytalocrinus? gracilis Wood (in Troost), p. 88, 1909. "St. Louis limestone. Huntsville, Alabama." ("Ste. Genevieve.")

Phacelocrinus internodius (Hall), n. comb.

Scaphiocrinus internodius Hall, p. 679, pl. 25, fig. 2, text fig. 107, 1858.
 "Kaskaskia limestone: Chester, Illinois." (St. Louis limestone *vide* Worthen, 1883. Possibly Ste. Genevieve.) Wachsmuth and Springer, p. 113 (336), 1880.

Phacelocrinus longidactylus (McChesney), n. comb.

Scaphiocrinus longidactylus McChesney, p. 7, text fig., 1860. "Kaskaskia division of the Carboniferous limestone, Kaskaskia, Illinois."—McChesney, pl. 4, fig. 4, 1865.—McChesney, p. 4, pl. 4, fig. 4, text fig., 1868. "Chester division of the sub-carboniferous limestone, Kaskaskia, Illinois."

Poteroicrinus (Scytalocrinus) decabrachiatus Hall. (Cited as synonym of.) Wachsmuth and Springer, p. 117 (340), 1880.

Phacelocrinus vanhornei (Worthen), n. comb.

Poteroicrinus vanhornei Worthen (in Worthen and Meek), p. 517, pl. 31, figs. 2, 3, 1875. "Upper division of St. Louis group, Alton, Illinois."

Poteroicrinus (Scytalocrinus) vanhornei Wachsmuth and Springer, p. 118 (343), 1880.

Scytalocrinus vanhornei Keyes, p. 213, pl. 26, fig. 3, 1894.—Springer, p. 145, pl. 16, figs. 13, 14, 1900.

Poteroicrinus arrectarius Miller and Gurley, p. 33, pl. 4, fig. 6, 1896.

Phacelocrinus wachsmuthi (Wetherby), n. comb.

Scytalocrinus wachsmuthi Wetherby, p. 155, pl. 5, fig. 4, 1880. "Kaskaskia (Chester) Group, Pulaski county, Kentucky." (Glen Dean.)—Wachsmuth and Springer, p. 238 (162), 1886.

Phacelocrinus wetherbyi (S. A. Miller), n. comb.

Poteroicrinus wetherbyi S. A. Miller, p. 36 (6), pl. 8, figs. 1, 1a, b, 1879. "Kaskaskia, Pulaski county, Kentucky." (Glen Dean.)

Poteroicrinus (Scytalocrinus) wetherbyi Wachsmuth and Springer, p. 118 (343), 1880.

Geologic and geographic distribution.—*Phacelocrinus* ranges as known from the St. Louis to the upper middle Chester (Glen Dean) of the Mississippi Valley, Alabama and Kentucky. An undescribed species is known in the Greenbrier of Maryland.

Relationships.—*Phacelocrinus* in its simplicity of form resembles *Hypselocrinus*. No one, after handling specimens of the two genera, would have difficulty separating them, even in the case of dorsal cups. The arms of *Phacelocrinus* are relatively shorter and stouter than in *Hypselocrinus* in comparing similar stages in phylogeny. In *Phacelocrinus* the IBr are either clearly two in number or have fused into a high, compound brachial, deeply constricted medially. This lack of fusion of the two plates is very apparent in the St. Louis species, though the degree of fusion varies among the rays of the same specimen. Even in the Chester, however, either through incomplete fusion or fracture on the suture, the compound nature of the brachial is often seen. In *Hypselocrinus* there is but a single primibrach, and when occasionally a variation showing two primibrachs is found in one or two rays, the second is obviously an additional brachial. The gaping articulating sutures of *Phacelocrinus* are in marked contrast to the close union in *Hypselocrinus* as usually seen. The column in *Phacelocrinus* is pentagonal in section, as against the round column of *Hypselocrinus*. The ventral sac of *Phacelocrinus* is relatively shorter and composed of larger plates than in *Hypselocrinus*.

. . . *Pegocrinus*, n. gen.

Genotype.—*Poteriocrinus bijugus* Trautschold.

Generic diagnosis.—

Crown. High, compact, arms attaining a length 15 times or more that of the dorsal cup.

Dorsal cup. Broadly turbinate. Plates thick.

IBB. Small, partially anchylosed into a firm disk, clearly visible in side view. Sutures well shown.

BB. Variable in size and shape, barely meeting laterally or on very short faces. The post B is high and narrow, supporting RA on its long, upper right shoulder. Above it barely meets anal X. R post B is large, supporting RA on a narrow face.

RR. Large. Articulating facet the full width of the R. Suture not gaping. The upper surface of the R is very deep. There is a prominent fuleral ridge and a deep ligament pit. There is a large, well-defined pair of muscular fossae. The apposing edges of the R and IBr along the suture are strongly crenulate.

IBr. Variable in number without respect to the rays. Two or three in number, usually two.

Arms. Long and massive, two undivided rami to each ray. Br low, quadrangular or with slightly sloping faces, each bearing a long, stout pinnule. Food groove shallow, no axial canal. Margins of Br crenulate.

Post IR. RA small, elongate, narrow. Anal X small, high, narrow. RT small, in some cases barely contacting RA.

Ventral sac. Poorly known. One specimen shows the partially dissociated plates in approximately their original position. According to this, the sac is short, erect, and fairly stout in relation to the dorsal cup. The plates are small and thin, forming a fragile structure.

Column. Circular in section, with stellate lumen.

Characteristic species of the genus.—

Pegocrinus bijugus (Trautschold), n. comb.

Poteriocrinus bijugus Trautschold, p. 14, pl. 4, figs. 1-3, text fig., 1867.
 Junger Bergkalk (Moscovian), Miatschkowa, Russia.—Trautschold,
 text fig., 1879.—Jaekel, p. 64, fig. 54a, 1918.

Poteriocrinus (*Scytalocrinus*) *bijugus* Wachsmuth and Springer, p. 118 (343),
 1880.

Geologic and geographic distribution.—The genus is known at present only
 in the Moscovian (Pennsylvanian) of Russia.

Relationships.—There seems to be no described genus with which *Pegocrinus*
 may be confused. Two poteriocrinoid genera associated with *Pegocrinus*
 are readily distinguished, although one of them was apparently confused
 with it by Trautschold. Both *Moscovicrinus* and *Ophiurocrinus* have
 high, rather narrowly turbinate dorsal cups as against the broadly turbinate
 cup of *Pegocrinus*. The IBB of *Pegocrinus*, meeting on very narrow faces and
 practically anchylosing into a solid disk, are in marked contrast to the high
 IBB of the other two genera. The patterns of the plates of the posterior IR
 are unlike. *Moscovicrinus* has branching arms and a remarkable circinate
 ventral sac, both wanting in *Pegocrinus*.

Of the original specimens figured by Trautschold (1867, pl. 4), specimen
 figure 2 was sent by Trautschold to Wachsmuth and is now in the Springer
 collection in the United States National Museum. Jaekel (1918, p. 64, fig.
 54a) states that his figure is from the "holotype" in Breslau. It could not be
 either specimen figures 2 or 3. Owing to the great number of inaccuracies in
 this work of Jaekel, it is doubtful that it really represents any one of the
 three specimens of Trautschold. At any rate, Jaekel does not indicate which
 specimen he chose as type. Owing to the uncertainties of the matter, I have
 chosen specimen figure 2, plate 4, of Trautschold (1867) as holotype.

The specimen figured by Trautschold (1879, pl. 14, fig. 3) as *Poteriocrinus*
bijugus is certainly not that species. It probably is referable to *Poteriocrinus*
originarius, for which Jaekel erected the genus *Ophiurocrinus*.

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